

Policing's New Eye in the Sky

The Use of Unmanned Aerial Vehicles in Law Enforcement

By Ron Chambers

Imagine having the ability to see what is happening around the corner, around the block or on the other side of town from a single location. Imagine your local police being able to monitor the actions of a fleeing suspect without exposing officers or the public to unnecessary danger. What if you could watch and record the movements and activities of a vehicle or an individual over an extended period of time through your laptop computer? Think about it; live aerial surveillance of a critical incident without the expense, noise and intrusion of traditional helicopters. Now, if you're a cop, imagine all these things in the trunk of your patrol car ready to be deployed on demand in the field.

Does this sound like a scene from George Lucas' latest film, or a fantasy from a science fiction novel? In reality, these technologies are available today, and are changing the way intelligence information is gathered, the way surveillances are conducted and how the police respond to critical incidents. If you want to see what is happening on the ground, just look up.

UNMANNED AERIAL VEHICLES FOR CIVILIAN LAW ENFORCEMENT

Used widely in combat in Afghanistan and the Persian Gulf, unmanned aerial vehicles (UAV) represent a technology that is easily adaptable to the policing environment. For years, public safety agencies have relied on expensive helicopter programs as their sole

means of surveying crime from above; however, many departments “go without” due to the cost of establishing and maintaining such programs. At the same time, the demand for quick responses to crime and unrest continue to intensify while budgets decrease and the number of cops available in the field may be less than in years past. UAV’s provide a cost-effective solution to safe and speedy response to crime scenes without endangering the lives of the innocent who might otherwise be in the path of a hurried officer or deputy trying to catch up with the demand for their services.

Consider the benefits an unmanned aerial vehicle (UAV) could offer in the following scenario:

An alarm activation at a local bank is received by the Communications Center. The call for service is entered into the Computer Aided Dispatch System and the nearest available patrol units receive the call and start in route. As those units move towards the location, the GPS location of the call is sent to a UAV that is on patrol 400 feet above the city. The UAV utilizes the GPS coordinates to identify the most direct route to the location and starts towards the call. As the UAV approaches the bank it scans and records the license plates of vehicles leaving the area along a main thoroughfare. All the time providing the responding units with a live video downlink to the Mobile Digital Computers mounted in their patrol cars. Once the UAV is over the bank it enters into an orbital pattern offering the responding units a real time view of the bank and surrounding area, long before any patrol car arrives on scene. A possible suspect is

seen on video as he exits the bank and enters a waiting vehicle. The vehicle leaves the area at a high rate of speed. The UAV is directed by monitoring personnel to lock onto that vehicle and establish a moving surveillance. Responding personnel meet with the bank manager and confirm a crime has occurred. The UAV maintains surveillance of the suspect vehicle and other resources move into position and attempt to stop the suspect. When the suspect fails to yield to the officers and flees in the vehicle the pursuing patrol units back off and allow the UAV to monitor the position of the suspect. Once the suspect thinks he has eluded the police, the suspect abandons the vehicle and starts jumping over fences and running through yards. Patrol officers establish a perimeter utilizing information from the live wireless video link. An arrest team is moved into place and takes the exhausted suspect into custody without a struggle, without a foot pursuit, without a vehicle pursuit and with minimal risk to the officers, citizens and suspect.

All of the technologies mentioned in this scenario are available and in use by military units and law enforcement agencies around the world. This technology is being used to keep soldiers and officers safe from threats that can only be detected with aerial surveillance. UAV systems offer the ability to see what is happening around the corner or on the other side of the city when helicopter or fixed wing air support is impractical or unavailable. If these tools and technologies were placed into service the benefits for the law enforcement industry and the communities we serve would be momentous.

WHAT'S IN IT FOR US?

Preventing dangerous situations and effectively managing high-risk incidents is the responsibility of all law enforcement professionals. Unmanned aerial vehicles (UAV) can offer the law enforcement community a new way to see, hear and smell what is going on while protecting officers, citizens and even criminal suspects from risk. The new generation of UAV can give you that capability day or night, rain or shine at a fraction of the cost of buying and maintaining a traditional manned aircraft.

Law enforcement is an industry steeped in tradition and slow to embrace change. The industry has used many of the same methods and techniques for decades. Once a practice is adopted it becomes part of the police culture and soon becomes deeply engrained in the industry. Tenured stakeholders who respond to new ideas with a “we’ve always done it that way” attitude frequently view the introduction of new ideas and technologies with skepticism and suspicion. Because of this slow evolution, the law enforcement industry has the tendency to resist new ideas and pass them off as fads and quick fixes. This resistance to change can be beneficial by maintaining traditions and promoting a steady progression of ideas; it can also prove detrimental to advancements and cause stagnation in the industry. The introduction of UAV technology to the law enforcement industry will require vision and risk-taking, two traits that are often difficult to muster.

Many modern UAV are small enough to be stored and transported in the trunks of police vehicles. Making them readily available to field personnel for immediate deployment on a critical incident. Images and sensor information is digitally broadcast on a wireless link

to monitors that allow persons on the ground the ability to see an overhead image of an area or determine the conditions that exist in the area of the UAV.

MORE THAN A FLYING VIDEO CAMERA

The use of UAV technology can offer a variety of information to the operator depending on the mission and how the UAV is equipped. Video surveillance techniques can be used for long-term surveillance on target areas, freeing personnel for other duties.ⁱ Night vision equipment provides the user the ability to see in the dark by gathering ambient light and using it to make images clearer. An infrared camera can see lower frequency energy emissions, which are undetectable by the human eye and then convert those images to a video signal, which can be seen on a television or on the camera's eyepiece. Infrared imaging uses electromagnetic waves that lie just past visual light spectrum and just before the microwave spectrum to provide an image of the target that would otherwise be invisible to the human eye.ⁱⁱ Imaging radar operates by emitting an electromagnetic pulse, which illuminates the target. The emitted energy then reflects back to the point of transmission where the image is recorded. Imaging radar is effective in all weather and lighting conditions and is a very effective tool for identifying both fixed and moving objects.ⁱⁱⁱ

These are only a few of the technologies that are currently in use on UAV by law enforcement, the military and civilian organizations. The ability to conduct surveillances from the air, see in the dark and detect variations in heat could prove highly useful in field situations. Many of these tools were initially developed as top-secret projects

intended for military applications. Over time they have been declassified and are now available to law enforcement agencies and the civilian market. There are undoubtedly other UAV technologies in currently use and under development by the military that may have future surveillance and information gathering applications for law enforcement UAV systems. The collection and analysis of information is critical to the law enforcement function. The use of UAV technology would significantly improve the information gathering capabilities of the law enforcement community.

INFORMATION GATHERING

The law enforcement industry has always relied heavily on information accumulated from a variety of sources to assess community and agency needs, aid in strategic planning and tactical decision making and to serve as an indicator for future expansion. Historically, information has been obtained from a wide variety of sources including; citizens, business owners, community groups, educational institutions and personal observations. It can be obtained in a relaxed and methodical manner or sought out with urgency for immediate application to an ongoing situation. Such information is not only used to address current needs but has future applications as well.

Historically, personal observation skills were the most prevalent form of intelligence gathering. Witness and suspect statements were utilized in nearly every investigation conducted by police. For many decades, personal observations by law enforcement officers or the statements of others were exclusively relied upon to determine the truth. More recently, the application of advanced technology has resulted in some of the most

significant changes to the field of law enforcement.^{iv} No matter how the information is gathered and utilized, it is critical that it be accurate, functional and accessible by those who need the information. Think back; In March 1933, the first two-way AM mobile radio was installed in a patrol car of the Bayonne Police Department in New Jersey.^v This technology fundamentally altered the way modern law enforcement agencies identified, responded to and resolved situations.^{vi} Photographs and videotapes are capable of recording events as they occur or can permanently freeze-frame a scene to allow investigators, attorneys, judges and juries the ability to see things as they were at the time the images were recorded.^{vii} No doubt, there were those who thought these cutting-edge advancements were “flashes in the pan” that detracted from policing as it had been done. As technology continues to advance, law enforcement’s need to identify, process, capture and distribute information will continue to increase. There is little doubt that UAV technology will play a role in that future, not as a break from the past, but continuing the tradition of capitalizing on advancements to enhance the effectiveness of the police.

A LOOK BACK INTO UAV HISTORY

Modern unmanned aerial vehicles can be traced back to World War I when their predecessors were designed and tested as aerial torpedoes or flying bombs. One of the first such devices was the Curtiss-Sperry Aerial Torpedo, first tested in June of 1917.^{viii} The United States Army Air Service tested a number of Kettering Bugs in 1918, a small airplane with a sixty-mile range flown by remote control. In the 1920s, a British Company called, the British Royal Aircraft Establishment built and tested the Larynx, a

radio controlled plane with a 100-mile range. Though it was not recognized at the time, these radio-controlled aircraft were the predecessors to the modern unmanned aerial vehicles.^{ix}

In May 1938, Leigh Dugmore Denny, the owner of the Van Nuys, Ca. based Radioplane Company, contracted with the United States Army Artillery Corps to manufacture target drones to train anti-aircraft gunners.^x When the United States entered World War II in December 1941, the demand for radio-controlled target drones and radio controlled aircraft skyrocketed. During the war, Germany produced and deployed the V-1, the world's first operational cruise missile.^{xi} The V-1 suffered from a lack of precision guidance and could not be used against a specific target. The United States equipped a variety of conventional aircraft with remote control flight capabilities during the war and loaded the aircraft with explosives; a crew would then fly the plane partway to the target and bail out. The flying bomb was then guided to its target by remote control from another aircraft.^{xii}

Between January 1969 and June 1973 the Lightning Bug developed by Ryan Aeronautical Company flew 1,773 low-altitude reconnaissance missions. Most were photoreconnaissance flights, but 121 missions flown after 1972 involved real-time television imaging.^{xiii} The Lightning Bugs were the first to provide real-time video imaging to ground personnel and thus began the modern era of unmanned aerial vehicles capable of relaying real-time images to ground forces.

The deployment of unmanned aerial vehicles and technology continued during the Cold War. The development of autonomous navigation systems intended for use in intercontinental ballistic missiles and intercontinental cruise missiles significantly benefited the unmanned aerial vehicle industry. Autonomous navigation technology initially relied on inertial navigation systems and later integrated global positioning satellite technology to control the missiles and eventually the UAVs. As a result of these cutting edge technologies, a Global Hawk UAV was able to fly non-stop from California to Australia and land within feet of the centerline of the runway in April of 2001.^{xiv}

The United States and Israel are the current leaders in unmanned aerial vehicle technology. Some of those vehicles utilize jet propulsion and are capable of 35 hours of sustained flight. Many of the current unmanned aerial vehicles are being developed to also serve as unmanned combat aerial vehicles (UCAV). These UCAV's will be capable of delivering a substantial payload onto a target on the other side of the world and then returning without endangering a pilot.^{xv} While the use of a UCAV in a law enforcement role is highly unlikely, the lessons learned from their development and deployment will continue to benefit UAV technology on all levels.

GOOD THINGS COME IN SMALL PACKAGES

While these large-platform unmanned aerial vehicles have the ability to fly above 60,000 feet, carry heavy payloads and remain aloft for more than a day at a time, their application to the law enforcement industry is limited. The smaller, hand launched or bungee launched mini-UAVs may be more adaptable to the law enforcement mission.

Five UAV in particular show promise with regard to use by the police:

- The Pointer UAV was delivered to the US military in 1989. Developed by AeroVironment, this 8 pound, 6 foot long aircraft could be equipped with either color video or infrared onboard camera systems. It was capable of relaying live video to the ground and was propelled by a quiet electric motor that could keep it in the air for 90 minutes. The Pointer has been described as a “back packable, hand launched UAV”.^{xvi}
- The Dragon Eye mini-UAV, which first flew in May of 2000, has a four-foot wingspan and weighs just over four pounds. In the fall of 2003, the United States Marine Corps ordered 311 Dragon Eye systems, each with three aircraft and one ground control station.
- The Lockheed Martin Desert Hawk is a five-pound mini-unmanned aerial vehicle with a 90-minute flight time.
- The DRS Unmanned Technologies Neptune was designed for at-sea launches. It is carried in a 72x30x20 inch case that transforms into a pneumatic launcher. The Neptune weighs 80 pounds and can remain aloft for four hours.^{xvii}
- The Raven is one of the most recent additions to the United States military mini-unmanned aerial vehicle lineup. It was developed by AeroVironment and is currently in use in Iraq and Afghanistan. The Raven weighs just over four pounds, has color video and infrared capabilities and is capable of remaining aloft for 90 minutes.^{xviii}

Due to their small size, ease of use and lightweight, most of these mini-UAVs are highly mobile and quickly deployed. These factors make them the ideal choice for use in a law enforcement role.

UAV vs. HELICOPTER

The potential benefits of UAV in law enforcement are limited only to the imagination and resourcefulness of its users. The proper implementation of this technology to the civilian law enforcement community could have a significant impact on the future of policing. The availability of an affordable, effective and quickly deployed surveillance platform would offer a wide variety of options that are currently not available in the industry. While the introduction of mini-UAVs will not necessarily replace the manned aerial law enforcement vehicles currently in use, they will offer an alternative that is more affordable, less intrusive, less disruptive to the community, less visible to the target and immediately available for deployment from the trunk of a car.

The costs associated with a mini-UAV are significantly lower than the cost of purchasing, maintaining and operating traditional law enforcement helicopter. The total cost recovery billable rate for the Ventura County Sheriff's Department Bell 205-A1 (Copter #8) helicopter is currently \$2695.00 per hour. The FY 2004/2005 budget for the Ventura County Sheriff's Department Aviation Unit was \$4.5 million. About 58 percent of the Aviation Unit's activations involved law enforcement services. The remaining 42 percent were primarily dedicated to fire services. The initial cost to purchase a Bell 212-A1 (Copter #9) would be \$3.5 to \$4 million.^{xix} A mini-UAV platform with all the

necessary sensor equipment and monitoring station would be significantly less expensive to purchase and operate. As budgets continue to shrink and costs continue to rise, the deployment of UAV technology in appropriate situations will become an increasingly viable option.

UAV WITH A BADGE

Mini-UAVs can be deployed in a matter of minutes providing the operator the ability to immediately see live color video or infrared imagery of the target. That live video feed is not available with most manned law enforcement aerial vehicles requiring ground personnel to rely upon the observer to describe and interpret the target for ground personnel.^{xx} Products are currently available that allow individual ground personnel to monitor the live video provided by a UAV. Tadiran Spectralink is currently marketing a three-inch LCD video monitor that mounts to the wrist with Velcro straps. The color monitor displays real-time video that is beamed from UAVs overhead. Ground personnel can use these monitors to individually interpret and evaluate surveillance information as events are unfolding.^{xxi}

In November of 2004, two Northrop Grumman Hunter UAVs equipped with infrared sensors began conducting reconnaissance flights along the Mexico/Arizona border for the Department of Homeland Security. "These vehicles offer unequalled surveillance capabilities that not only increase the apprehension of potential terrorists, but also provide much safer working conditions for Border Patrol agents."^{xxii} On March 4, 2005, at the 77th Academy Awards, the Tactical Aerospace Group of the Department of

Homeland Security used a UAV helicopter to provide an aerial downlink that provided command personnel the ability to monitor activity around the event.^{xxiii}

Mini-unmanned aerial vehicles have also been deployed for field-testing during law enforcement training exercises. During Operation Determined Promise, a nationwide terrorism-training scenario, an AeroVironment mini-UAV was deployed during the Southern California module of the scenario. The vehicle provided live video surveillance of the scene during a simulated train derailment that involved the possible detonation of an improvised biological or nuclear device.^{xxiv}

As you see, the law enforcement industry has already utilized UAV technology in field operations on a limited basis. The use of UAV technology is likely to continue to increase as more equipment becomes available and as the UAV industry begins to focus more on the needs of the law enforcement market. Competition between suppliers will eventually increase the affordability of UAV technology and help develop systems designed specifically for the law enforcement industry.

OUT OF THE BATTLEFIELD AND INTO THE COMMUNITY

UAV technology has proven highly effective on the battlefield. This equipment has been responsible for saving lives and changing the way battles are fought. If UAV systems are to gain a foothold in the law enforcement industry, they will need to be accepted by the police as well as members of the community. More people are becoming aware of UAV technology due to their successes on the battlefield. The integration of this technology

will undoubtedly be accepted by some and rejected by others. Privacy issues and concerns over abuse will need to be weighed against the overall benefits of the technology. Reliability and ease of use will also be necessary to keep these systems operating under field conditions with a minimum of training.

Autonomous flight capabilities will make the UAV systems more flyable, requiring fewer inputs during operations. But above all UAV systems will need to become more affordable so agencies with competing interests and ever-shrinking budgets will be able to afford to place the technology into service. Systems currently in use by the military will eventually be rotated out of service and be replaced with newer technology. The eventual availability of surplus UAV systems from the military could play a key role in implementing UAV into law enforcement. Until then, policing should look to alternate forms of funding to implement and support a UAV program.

Law enforcement agencies should consider working closely with UAV manufacturers and the military to develop more affordable UAV systems designed for service in the civilian market. State and Federal grant dollars as well as forfeited asset money could be used to offset the initial and recurring costs associated with a UAV program. Cooperative agreements between local jurisdictions could lessen budgetary pressure. Public donations are another way that the burden of starting a UAV program could be lessened. The cost of UAV systems are still high but there is a good chance those costs will diminish over time. That increased affordability will provide a greater opportunity for the law enforcement industry to reap the benefits of this exciting new technology.

LOOKING TOWARD THE FUTURE

The use of unmanned aerial vehicles has become commonplace in military settings for both urban and wildland scenarios. The size of the UAV and the capabilities can vary greatly. The use of this technology allows decision-makers to minimize the need for human pilots to operate in dangerous combat situation. The intelligence information and surveillance opportunities presented by UAVs are staggering. Small rotary and fixed wing UAVs are already being used in limited applications by law enforcement. Because of their affordability, reliability, low noise and limited intrusion characteristics it is only a matter of time until UAV technology is widely used by the law enforcement industry. The law enforcement community should foster cooperative relationships with UAV manufacturers and work to develop UAV systems that can offer the most to the law enforcement community. The use of UAV to assist the law enforcement industry is the next logical step in their deployment. Now is the time for law enforcement leaders and the UAV manufacturers to join together to develop the best possible technology for the civilian law enforcement market.

ⁱ Thibault, Edward A. Proactive Police Management - 3rd edition. Englewood Cliffs, New Jersey: Prentice Hall, 1995, Page 364.

ⁱⁱ Denio, Harley. "I.R. Technology." Predictive Maintenance Thermography. Oregon Infrared LLC. 18 Mar. 2005 <http://www.oregoninfrared.com/IR_technology.htm>.

ⁱⁱⁱ "Tactical Imagery Intelligence Operations TJIDBT." Federation of American Scientists. Feb. 1996. Federation of American Scientists. 20 Feb. 2005 <<http://www.fas.org/irp/doddir/army/tacimlp.htm>>.

^{iv} Langworthy, Robert H. Policing in America. New York: Macmillian Publishing Company, 1994, Page 368.

^v Institute of Electrical and Electronics Engineers, Inc., "IEEE History Center." Institute of Electrical and Electronics Engineers, Inc., 2 Jan. 2003. 3 Feb. 2006 <http://www.ieee.org/organizations/history_center/milestones_photos/two_way.html>.

^{vi} Langworthy, Robert H. Policing in America. New York: Macmillian Publishing Company, 1994, Page 368.

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- ^{vii} Bennett, Wayne W. *Criminal Investigations* - 4th edition. Minneapolis/St. Paul: West Publishing Company, 1994, Page 54.
- ^{viii} Newcome, Laurence R. *Unmanned Aviation*. Reston, Virginia: American Institute of Aeronautics and Astronautics Inc., 2004, Pages 19-22.
- ^{ix} Yenne, Bill. *Attack of the Drones - A History of Unmanned Aerial Combat*. St. Paul: Zenith Press, 2004, Pages 12-15.
- ^x Yenne, Bill. *Attack of the Drones - A History of Unmanned Aerial Combat*. St. Paul: Zenith Press, 2004, Pages 19.
- ^{xi} Yenne, Bill. *Attack of the Drones - A History of Unmanned Aerial Combat*. St. Paul: Zenith Press, 2004, Pages 19.
- ^{xii} Yenne, Bill. *Attack of the Drones - A History of Unmanned Aerial Combat*. St. Paul: Zenith Press, 2004, Pages 19-20.
- ^{xiii} Yenne, Bill. *Attack of the Drones - A History of Unmanned Aerial Combat*. St. Paul: Zenith Press, 2004, Pages 22-26.
- ^{xiv} Newcome, Laurence R. *Unmanned Aviation*. Reston, Virginia: American Institute of Aeronautics and Astronautics Inc., 2004, Page 71-81.
- ^{xv} Bone, Elizabeth. *Unmanned Aerial Vehicles - Backgrounds and Issues*. New York: Novinka Books, 2004, Page 41-48.
- ^{xvi} Yenne, Bill. *Attack of the Drones - A History of Unmanned Aerial Combat*. St. Paul: Zenith Press, 2004, Pages 37-38.
- ^{xvii} *Unmanned Aerial Vehicles - Roadmap 2002-2027*. N.p.: Core Federal Information Series, n.d., ISBN 1-59248-294-5, Pages 10-19.
- ^{xviii} Walsh, Brian. Business Development Manager, AeroVironment Inc. Personal interview. 17 Mar. 2005.
- ^{xix} Tennison, David. Ventura County Sheriff's Department Aviation Unit Commander, Telephone interview. 24 Mar. 2005.
- ^{xx} Walsh, Brian. Business Development Manager, AeroVironment Inc. Personal interview. 17 Mar. 2005.
- ^{xxi} Federman, Josef. "Wrist Gear Gives Israeli Troops Edge on Militants." *Ventura County Star* 5 Mar. 2005: A1.
- ^{xxii} Philpott, Don. "UAVs - Developing New Frontiers." *Homeland Defense Journal* Feb. 2005: Pages 6-11.
- ^{xxiii} South, Matt. Lead Test Engineer for Unmanned Systems, Navel Base Ventura County, Telephone interview. 22 Mar. 2005.
- ^{xxiv} Walsh, Brian. Business Development Manager, AeroVironment Inc. Personal interview. 17 Mar. 2005.